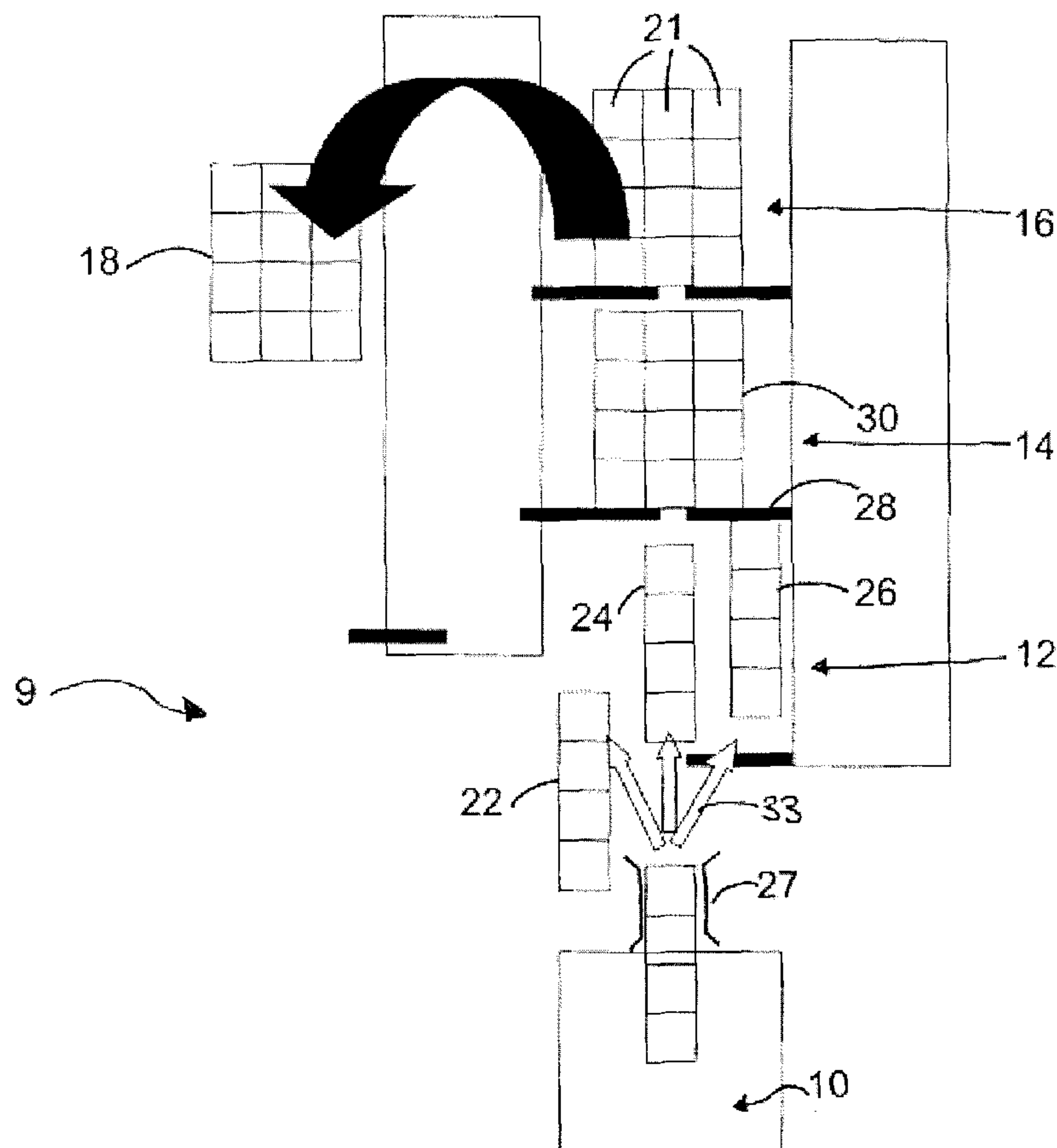




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(54) Titre : MACHINE D'EMBALLAGE
(54) Title: PACKAGING MACHINE



(57) Abrégé/Abstract:

ABSTRACT The invention relates to an apparatus for and a method of manipulating a plurality of articles. The apparatus preferably is a tertiary packaging apparatus capable of receiving a single-file stream of articles (21), preferably from a secondary packaging



(57) **Abrégé(suite)/Abstract(continued):**

apparatus (10). The apparatus comprises a dividing element (33) for splitting a received single-file stream of articles into two or more adjacent streams and an aligning element for collating articles in adjacent streams into an aligned rank of articles.

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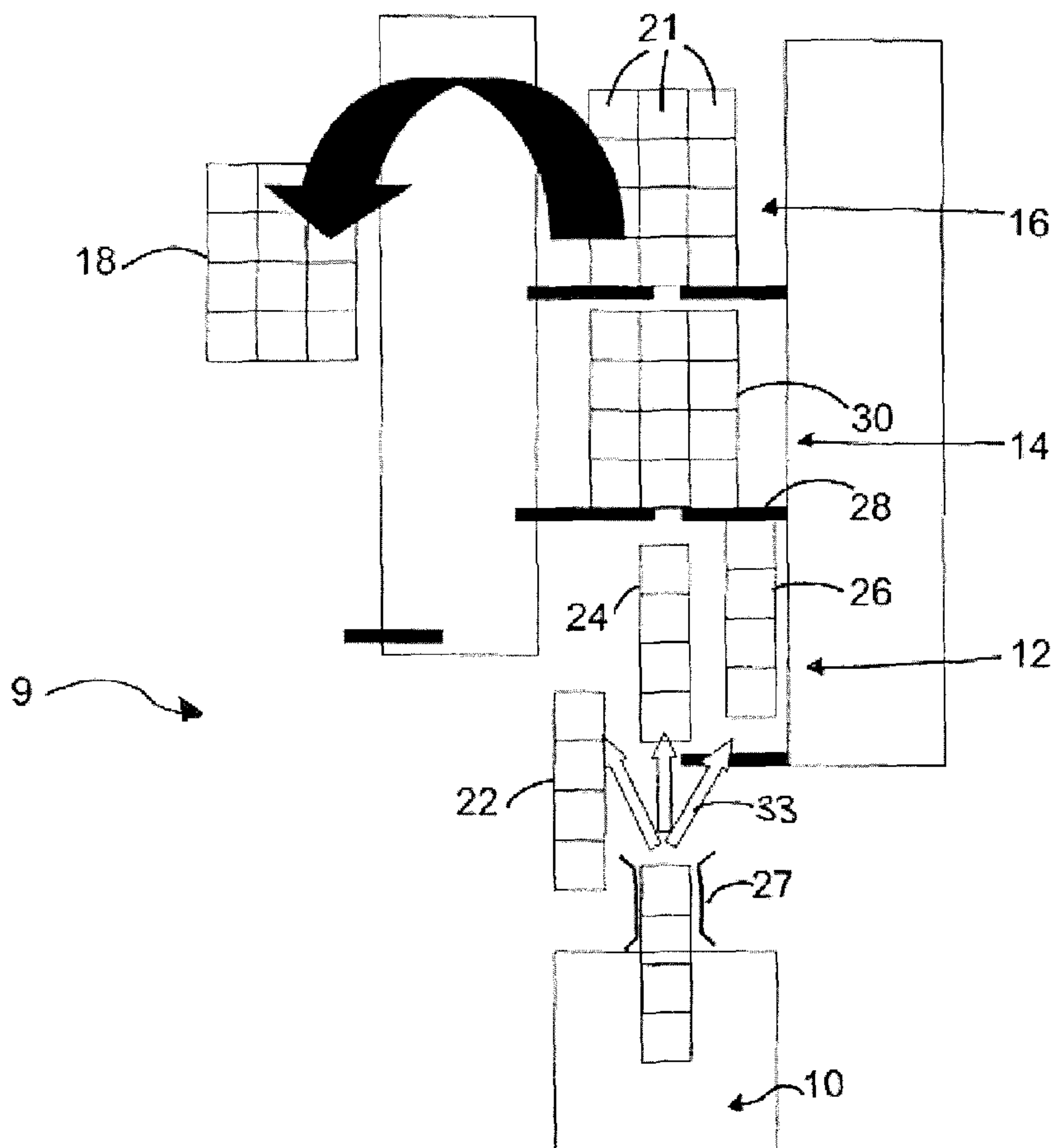
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(54) Title: PACKAGING MACHINE



(57) Abstract: ABSTRACT The invention relates to an apparatus for and a method of manipulating a plurality of articles. The apparatus preferably is a tertiary packaging apparatus capable of receiving a single-file stream of articles (21), preferably from a secondary packaging apparatus (10). The apparatus comprises a dividing element (33) for splitting a received single-file stream of articles into two or more adjacent streams and an aligning element for collating articles in adjacent streams into an aligned rank of articles.

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PACKAGING MACHINE

TECHNICAL BACKGROUND

This invention relates to an apparatus for and method of packaging articles, particularly but not exclusively to a method of and an apparatus for grouping articles and even more specifically but not exclusively to a method of and an apparatus for packaging secondary packages in a tertiary package such as a tray.

BACKGROUND

Currently primary packages such as bottles or cans are packaged in multiples in secondary packages such as cartons, and these cartons are subsequently transported to a separate location away from or off the secondary packaging line where the cartons are packaged in tertiary packages such as trays.

There is a need to improve the ergonomics of existing packaging lines and to integrate a tertiary packaging module into an existing secondary packaging line whilst minimizing the space dedicated to secondary packaging and tray packing on existing packaging lines.

The present invention therefore seeks to provide a packaging machine that comprises a combined secondary packaging line and tertiary packaging line.

SUMMARY

Accordingly, a first aspect of the invention provides an apparatus for manipulating a plurality of articles, the apparatus capable of receiving a single-file stream of articles and comprising a dividing element operable to split a received single-file stream of articles into two or more adjacent streams and comprising an aligning element operable to collate articles in adjacent streams into an aligned rank of articles.

Preferably the apparatus is a tertiary packaging apparatus and wherein the apparatus is structured and arranged such that it is couplable to a secondary packaging machine.

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Preferably an input of the apparatus is couplable to an output of a secondary packaging machine such that a single-file stream of articles output from the secondary packaging machine is directly receivable by the tertiary packaging apparatus.

Preferably the aligning element comprises a lug for retarding the passage of secondary packages in each of said two or more streams such that adjacent streams of secondary packages are arrangeable and alignable into a contiguous batch. Optionally two co-linear lugs are disposed on separate return conveyors.

Preferably the or each lug forms a leading lug of the contiguous batch it forms and is coupled to a lug conveyor mechanism. Preferably said leading lug additionally forms a trailing lug for engaging and transferring a preceding contiguous batch of articles.

Optionally the or each lug is operable at a lower velocity than that rate of output of secondary packages from the secondary packaging machine. Preferably the or each lug is operable at a fraction of the rate of output of the secondary packaging machine inversely proportional to the number of streams formed by the dividing element.

Optionally the apparatus comprises a transfer element for transferring a contiguous batch of secondary packages into a tray.

Preferably the apparatus comprises a tray conveyor for providing successive trays, each for loading with a contiguous batch of secondary packages, the tray conveyor being structured and arranged to flow in the opposite direction relative to the output flow of the secondary packaging machine. Optionally the transfer element and one of said stop bars are carried along the same return path.

Preferably, the dividing element comprises a guide which is moveable alternately into a series of positions to divide the output packages into two or more streams of secondary packages.

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Alternatively or additionally said guide is moveable in a first sequence of positions and successively moveable in a reverse sequence of positions. Preferably said moveable guide is pivotable.

5

According to a second aspect, the invention provides a method of manipulating a plurality of articles, the method comprising: receiving a single-file stream of articles; splitting the received single-file stream of articles into two or more adjacent streams and collating articles in adjacent streams into an aligned rank of articles.

10

Preferably the steps of receiving, splitting and aligning are carried out by a tertiary packaging apparatus and the method comprises coupling the apparatus to a secondary packaging machine.

15

Preferably the apparatus comprises a lug bar for retarding the passage of secondary packages in each of said two or more streams and the method comprises arranging and aligning secondary packages of adjacent streams into a contiguous batch.

20

Optionally the method comprises transferring a contiguous batch of secondary packages into a tray.

Preferably the method comprises providing successive trays, each for loading with a contiguous batch of secondary packages.

25

Preferably the step of splitting said two or more streams of secondary packages comprises moving a guide alternately into a series of positions. Even more preferably moving said guide is conducted in a first sequence of positions and successively conducted in a reverse sequence of positions.

30

According to a further aspect the present invention provides a packaging machine comprising a combined secondary packaging line and tertiary packaging line having:-

- 4 -

- (a) a secondary carton packaging section for packaging primary packages in secondary packaging cartons;
- (b) an assembly section for receiving the cartons containing primary packages and assembling them into groups of cartons;
- 5 (c) a collecting section for receiving the groups of cartons and assembling the groups into spaced columns;
- (d) a batch assembly section for receiving a plurality of columns and assembling them into a batch of contiguous cartons;
- (e) a tray loading section for assembling each batch of cartons onto a tray; and,
- 10 (f) an off-loading station for off-loading the trays onto a pallet.

Preferably sections (a) to (d) of the machine are parts of a continuously moving conveyor system.

- 15 According to yet a further aspect of the present invention there is provided a method of packaging comprising the steps of:-
- (g) packaging primary packages in secondary packaging cartons;
 - (h) assembling the cartons containing primary packages into groups of cartons;
 - (i) collecting the groups of cartons and assembling the groups into spaced columns;
 - 20 (j) assembling the columns into a batch of contiguous cartons;
 - (k) loading each batch of cartons onto a tray; and,
 - (l) off-loading the trays onto a pallet.

Preferably the steps (a) to (d) of the method are carried out on a continuously
25 moving conveyor system.

BRIEF DESCRIPTION OF THE DRAWINGS

Exemplary embodiments of the present invention will now be described, by way of example only, with reference to the accompanying drawings in which:

- 5 -

Figure 1 shows, schematically, a plan view of a tertiary packaging apparatus disposed at the output of a secondary packaging machine, according to a first embodiment of the invention;

5 Figure 2 shows a tertiary packaging apparatus according to a second embodiment of the present invention disposed at the output of a secondary packaging apparatus and illustrating a dividing section of the tertiary packaging apparatus in use;

Figure 3 shows the tertiary packaging apparatus of Figure 2 showing two lines of
10 divided secondary packages;

Figure 4 shows the tertiary packaging apparatus of Figure 2 showing three lines of divided secondary packages;

15 Figure 5 shows the assembly of a first contiguous batch of secondary packages;

Figure 6 shows the assembled batch being conveyed by the tertiary packaging apparatus and a next, successive batch being formed;

20 Figure 7 shows a transfer element of the tertiary packaging apparatus coming into alignment with the first contiguous batch of secondary packages;

Figures 8, 9 and 10 are upstream illustrations of the packaging machine of Figure 7 showing the first batch being lifted and transferred to a tray;

25

Figure 11 shows a tray in feed section of the tertiary packaging apparatus and a step in the loading of a tray with the first batch of secondary packages and

Figure 12 shows a tray packed with the first batch and the loading of a successive
30 tray.

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DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to Figure 1 of the accompanying drawings there is shown a tertiary packaging apparatus 9 constructed in accordance with the present invention, that comprises, in sequence an assembly section 12, a batch assembly section 14, a tray loading- section 16, and a pallet loading section 18. The tertiary packaging apparatus 9 is disposed at the output of a secondary packaging machine 10 such that secondary packages such as cartons 21 are directly received by the tertiary packaging apparatus. In other embodiments the secondary and tertiary packaging apparatus are integrally formed as a unitary machine. In other embodiments the tertiary packaging apparatus 9 is added on to an existing secondary packaging apparatus 10.

The secondary packaging apparatus 10 is of a well known conventional secondary packaging apparatus of the type used for packaging primary packages such as bottles or cans (not shown), into secondary packaging such as cartons 21. Conventionally in one form of secondary packaging the secondary packaging cartons 21 are formed by folding a carton blank (not shown) made from a flexible foldable sheet of materials such as paper board, around a plurality of primary packages (not shown). The specific design of the secondary packaging apparatus 10 is not important to the present invention providing that it operates to supply a succession of secondary packages 21 to the tertiary packaging apparatus 9.

Once completed the cartons 21 are output individually from the secondary packaging apparatus 10 in a continuous moving single-file stream of cartons 21 and are received in the assembly section 12 where the cartons 21 are grouped into a plurality of groups 22, 24 and 26 each made up of four cartons 21 by a guide means 27. Three groups 22, 24, 26 each made up of four cartons 21 are shown in Figure 1. In other embodiments the groups 22, 24, 26 contain only one carton 21. Indeed it is envisaged that any number of cartons 21 could be formed into such a group 22, 24, 26. In this embodiment the groups are equally sized, however in other embodiments the groups may contain a different number of cartons 21 according to packing

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requirements. In other embodiments fewer or greater than three groups 22, 24, 26 are formed. Preferably at least two separate groups are formed.

5 The cartons 21 leaving the secondary packaging section 10 are conveyed at a first pitch P_1 and are divided by dividing means 33 into three continuous streams to produce the groups 22, 24, and 26 as illustrated. The grouped cartons 22, 24, 26 are manipulated and conveyed at a second pitch P_2 .

10 At the assembly section 14 the groups 22, 24, 26, each of four cartons 21, are assembled in three spaced apart columns that advance along the same direction as staggered columns on a continuously moving conveyor system. As the columns 22, 24, 26 move together in a common direction, their movement is arrested by a stop bar 28 located in the collection section 16. The spaced columns 22, 24, 26 are brought together by moving the columns 22, 24 sideways to form a batch 30 of
15 twelve contiguous cartons 21 as shown.

It is envisaged in alternative embodiments that the columns 22, 24, 26 may be accelerated such that they are brought together to form a batch 30. In this way the relative speed between the columns is adjusted such that each of the columns is
20 brought into alignment.

At the tray loading section 18 the individual batches 30, each comprising twelve cartons 21, are stacked onto a tray 32, and the trays 32 are off-loaded from a continuously moving conveyor system (not shown) and stacked onto each other to
25 form a pallet (not shown) comprising a plurality of trays 32. It is envisaged that a series of vacuum suction cups could be used to lift the individual batches 30 for loading onto the tray 32.

30 A second embodiment is illustrated in Figures 2 to 12. In Figures 2 to 12 like reference numbers are used to identify features which are similar to those of the first embodiment. The like reference numbers are raised by a factor of 100 to distinguish between the first and second embodiments. Since the subsequent embodiments

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share similar features to the first embodiment, only certain differences will be described in detail.

Referring to Figures 1 and 2, a tertiary packaging apparatus 109 is coupled to a secondary packaging apparatus 110 by a conveyor element 140 such that the tertiary packaging apparatus 109 can directly receive a stream of secondary packages (or other articles) as they are output from the secondary packaging machine 110.

A dividing element 133 is provided to guide successive articles into separate adjacent lines. In operation, a leading secondary package 122 is directed into a leftmost line, thereafter a subsequent secondary package or other article 124 is directed into a central line or column and a further successive package 126 is guided and directed into a rightmost line. The successive packages, 122, 124, 126 are each conveyed at an output velocity V_1 of the secondary packaging machine 110 such that as the successive packages 122, 124, 126 pass through the dividing element 133 they are arranged in a staggered fashion on a conveyor element 140. This is partially shown in Figure 3.

First and second return conveyors 150, 152 (see figures 1 – 12) are provided with a series of stop bars (alternatively called flight bars or lugs) 128 which are conveyed around the return path of the first and second return conveyors 150, 152.

The flight bars or lugs 128 are arranged to interrupt the flow of secondary packages or articles as they exit the path of the dividing element 133. This is illustrated in Figure 3 where the leading and leftmost package 122 is slowed or retarded by the stop bars 128. The successive packages 124, 126 catch up with the leading package 122 (see Figure 4) until all three packages 122, 124, and 126 are aligned with their leading edge abutting the stop bars 128 such that a rank of three adjacent packages 122, 124, 126 is formed. This is illustrated in Figure 5 wherein a first rank of aligned, adjacent and contiguous packages forms a batch 130a. The stop bar(s) or lug(s) 128 sequentially act upon each package 122, 124, 126 of the rank to retard that package

- 9 -

122, 124, 126. In an alternative embodiment, packages 124 and 126 each may be accelerated to catch up with package 122.

Successive packages are conveyed from the secondary packaging machine 110 along the conveyor element 140 and through the dividing element 133 and the dividing process repeated such that subsequent ranks or contiguous batches 130b are formed. In other embodiments, a guiding element (not shown) of the dividing element 133 moves alternately from left to right and then returns dividing articles from right to left such that the rightmost package 126 becomes the leading package in alternate cycles through the dividing element 133. In yet a further embodiment, the dividing element directs more than one package 122 into the left most line and then a similar number of packages 124 into the central line and so on such that a series of ranks of packages 122, 124, 126 are formed into a successive contiguous batch 130b.

15

The stop bars or lugs 128 that serve to retard the output packages 122, 124, 126 of the succeeding batch 130b, provide a leading lug for conveying the preceding batch 130a of packages (as shown in Figure 6). As the leading lugs move away to propel the preceding batch 130a, the succeeding batch 130b is propelled by a further set of lugs 128 provided by the first and second conveyor elements 150, 152.

20

The number of articles or packages 122, 124, 126 in any batch 130a, 130b (and therefore pitch of the tertiary packaging machine) is determined by the number of lines or columns formed by the dividing element; the size of the packages 121 themselves; and the distance between successive stop bars or lugs 128 which corresponds to the number of packages within a column.

25

The stop bars 128 which interrupt the flow of secondary packages or articles 121 as they exit the path of the dividing element 133 are conveyed by the first and second return conveyors 150, 152 at a second velocity V_2 . In the present embodiment, the velocity V_2 of the stop bars 128 is a fraction of the velocity V_1 (of the output stream of packages and conveyor element 140) which is inversely proportional to the number

30

- 10 -

of lines formed by the dividing element 133. Specifically the output velocity of articles V_1 and velocity V_2 (of conveyance of the stop bars 128) is related as follows:

$$V_2 = \frac{1}{3} V_1$$

This applies when the secondary packaging machine pitch and tertiary packaging machine pitch are equal and therefore the tertiary packaging machine operates at one third of the speed of the secondary packaging machine (three packages being contained in one pitch of the tertiary packaging apparatus).

In other embodiments where the pitches are not equal (because for example more than one package is directed into each line at a time as described above) the relationship between speeds is retained through the number of packages put into a tertiary packaging machine pitch. For example, if the secondary packaging machine pitch is 400mm and the tertiary apparatus pitch is 500mm the tertiary packaging machine 109 advances 500mm while the secondary packaging machine 110 advances (3x400) 1200mm.

A transfer element 154 is conveyed over and brought into vertical alignment with the assembled ranks or batches of packages 130a, 130b as they are conveyed by the stop bars 128 down stream of the secondary packaging machine. This is shown in Figures 6-10. The transfer element 154 comprises transfer means 156, which in this embodiment takes the form of vacuum suction cups 156. In other embodiments, other suitable transfer means for moving all packages 122, 124, 126 of batch 130a is used.

Tertiary packages such as trays 130 are fed into the packaging line by tray conveyor 160 (see figure 9). Optionally, the conveyor 160 is arranged such that the direction (X) of travel of successive trays 130 is arranged oppositely to the direction (Y) of the conveyed batches 130a, 130b. In this way the floor space required to accommodate the tertiary packaging machine is minimized.

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The tertiary packaging machine 109 in other embodiments comprises a tray assembly section; in this embodiment assembled trays 132 are loaded onto the conveyor 160. The trays 132 are structured to receive the assembled batch 130a, 130b of packages and as such the pitch of a tray 132 matches or is substantially similar to that of a rank or contiguous batch 130a. The in feed of the trays 132 is synchronized with the formation and passage of batches 130a, 130b such that a transfer means 156 is operable to load a tray 132 with a batch of packages 130a. This is illustrated in Figures 10-12,

10 It can be appreciated that various changes may be made without departing from the scope of the present invention. For example, the size and number of lines and packages and number of packages within a batch may be adjusted for a variety of packing requirements.

15 The above-described embodiments are merely exemplary illustrations of implementations set forth for a clear understanding of the principles of the invention. Variations, modifications, and combinations may be made to the above-described embodiments without departing from the scope of the claims. All such variations, modifications, and combinations are included herein by the scope of this disclosure
20 and the following claims.

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CLAIMS

1. Apparatus for manipulating a plurality of articles, the apparatus capable of receiving a single-file stream of articles and comprising a dividing element operable
5 to split a received single-file stream of articles into two or more adjacent streams and comprising an aligning element operable to collate articles in adjacent streams into an aligned rank of articles.
2. Apparatus according to claim 1 wherein the apparatus is a tertiary packaging
10 apparatus and wherein the apparatus is structured and arranged such that it is couplable to a secondary packaging machine.
3. Apparatus according to claim 2 wherein an input of the apparatus is couplable
15 to an output of a secondary packaging machine such that a single-file stream of articles output from the secondary packaging machine, is directly receivable by the tertiary packaging apparatus.
4. Apparatus according to any one of the preceding claims wherein the aligning
20 element comprises a lug for retarding the passage of secondary packages in each of said two or more streams such that adjacent streams of secondary packages are arrangeable and alignable into a contiguous batch.
5. Apparatus according to claim 4 comprising two co-linear lugs disposed on
25 separate return conveyors.
6. Apparatus according to any one of claims 4 or 5 wherein the or each lug
forms a leading lug of the contiguous batch it forms and is coupled to a lug conveyor mechanism.
- 30 7. Apparatus according to claim 6 wherein said leading lug additionally forms a trailing lug for engaging and transferring a preceding contiguous batch of articles.

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8. Apparatus according to any of claims 4 to 7 wherein the or each lug is operable at a lower velocity than that rate of output of secondary packages from the secondary packaging machine.
- 5 9. Apparatus according to claim 8 wherein the or each lug is operable at a fraction of the rate of output of the secondary packaging machine inversely proportional to the number of streams formed by the dividing element.
- 10 10. Apparatus according to any one of claims 3 to 9 comprising a transfer element for transferring a contiguous batch of secondary packages into a tray.
- 15 11. Apparatus according to claim 10 comprising a tray conveyor for providing successive trays, each for loading with a contiguous batch of secondary packages, the tray conveyor being structured and arranged to flow in the opposite direction relative to the output flow of the secondary packaging machine.
12. Apparatus according to claim 11 wherein the transfer element and one of said stop bars are carried along the same return path.
- 20 13. Apparatus according to any one of claims 1 to 12 wherein the dividing element comprises a guide which is moveable alternately into a series of positions to divide the output packages into two or more streams of secondary packages.
- 25 14. Apparatus according to claim 13 wherein said guide is moveable in a first sequence of positions and successively moveable in a reverse sequence of positions.
15. Apparatus according to claim 13 or 14 wherein said moveable guide is pivotable.

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16. A method of manipulating a plurality of articles, the method comprising:
receiving a single-file stream of articles; splitting the received single-file stream of
articles into two or more adjacent streams and collating articles in adjacent streams
5 into an aligned rank of articles.

17. A method according to claim 16 wherein the steps of receiving, splitting and
aligning are carried out by a tertiary packaging apparatus and wherein the method
comprises coupling the apparatus to a secondary packaging machine.

10

18. A method according to claim 16 wherein the apparatus comprises a lug bar
for retarding the passage of secondary packages in each of said two or more
streams and the method comprises arranging and aligning secondary packages of
adjacent streams into a contiguous batch.

15

19. A method according to claim 18 comprising transferring a contiguous batch of
secondary packages into a tray.

20. A method according to claim 19 comprising providing successive trays, each
20 for loading with a contiguous batch of secondary packages.

21. A method according to any one of claims 16 to 20 wherein the step of splitting
said two or more streams of secondary packages comprises moving a guide
alternately into a series of positions.

25

22. A method according to claim 21 wherein moving said guide is conducted in a
first sequence of positions and successively conducted in a reverse sequence of
positions.

- 15 -

23. A packaging machine comprising a combined secondary packaging line and tertiary packaging line having :

- 5 (a) secondary carton packaging section for packaging primary packages in secondary packaging cartons;
- (b) an assembly section for receiving the cartons containing primary packages and assembling them into groups of cartons;
- (c) a collecting section for receiving the groups of cartons and assembling the groups into spaced columns;
- 10 (d) a batch assembly section for receiving a plurality of columns and assembling them into a batch of contiguous cartons;
- (e) a tray loading section for assembling each batch of cartons onto a tray; and
- (f) an off-loading section for off-loading the trays onto a pallet.

15 24. A machine according to claim 1 wherein sections (a) to (d) are parts of a continuously moving conveyor system.

25. A method of packaging comprising the steps of:- packaging primary packages in secondary packaging cartons;

- 20 (m) assembling the cartons containing primary packages into groups of cartons;
- (n) collecting the groups of cartons and assembling the groups into spaced columns;
- (o) assembling the columns into a batch of contiguous cartons;
- (p) loading each batch of cartons onto a tray; and
- 25 (q) off-loading the trays onto a pallet.

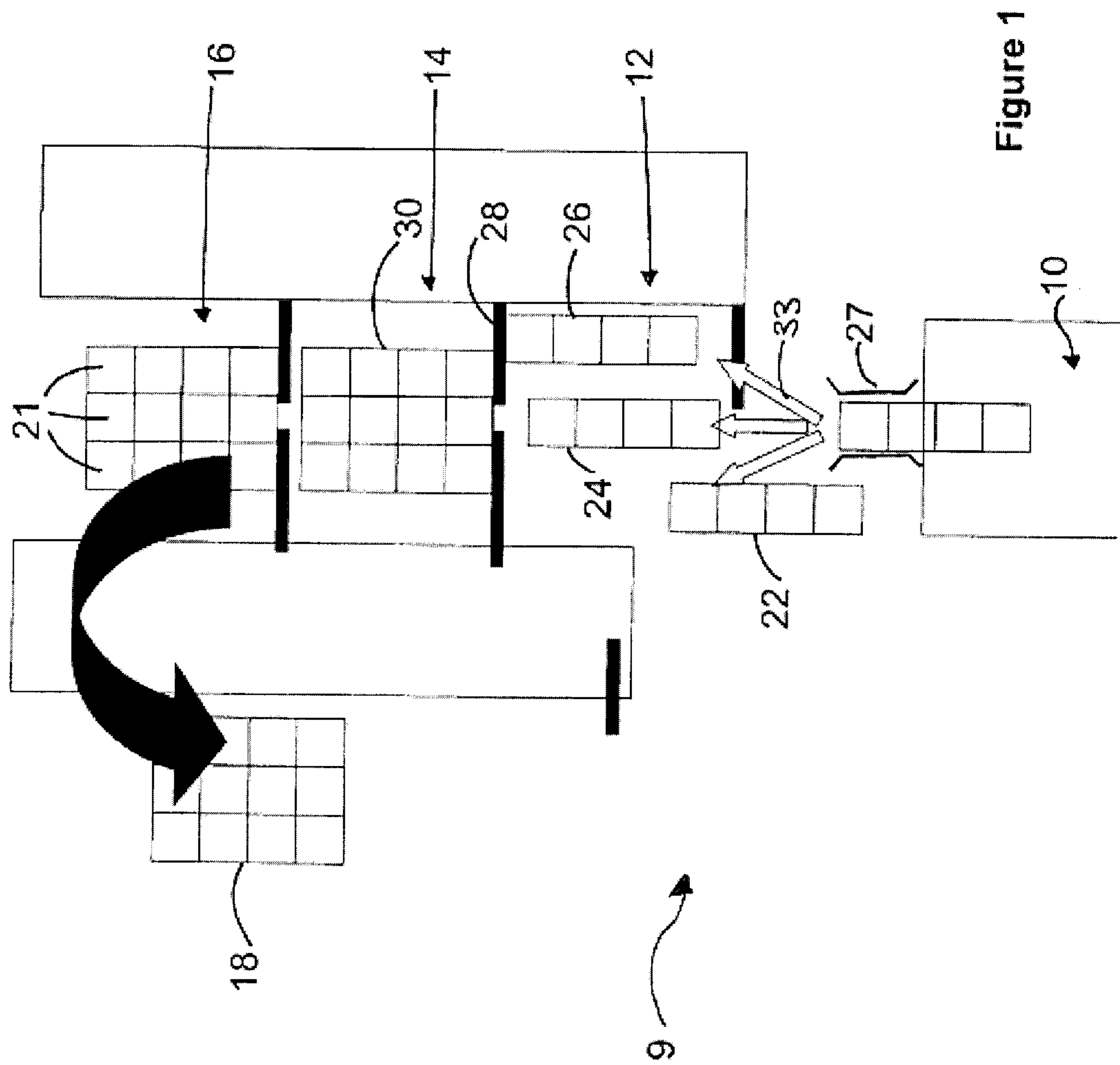
26. A method according to claim 3 wherein the steps (a) to (d) are carried out on a continuously moving conveyor system.

30 27. A packaging system comprising a secondary packaging machine for packaging multiple primary packages into a secondary package and a tertiary packaging machine according to any one of claims 2 to 15, 23 or 24

- 16 -

28. A tertiary package loaded by the method according to any one of claims 16 to 22, 25 or 26.

- 1/12 -



- 2/12 -

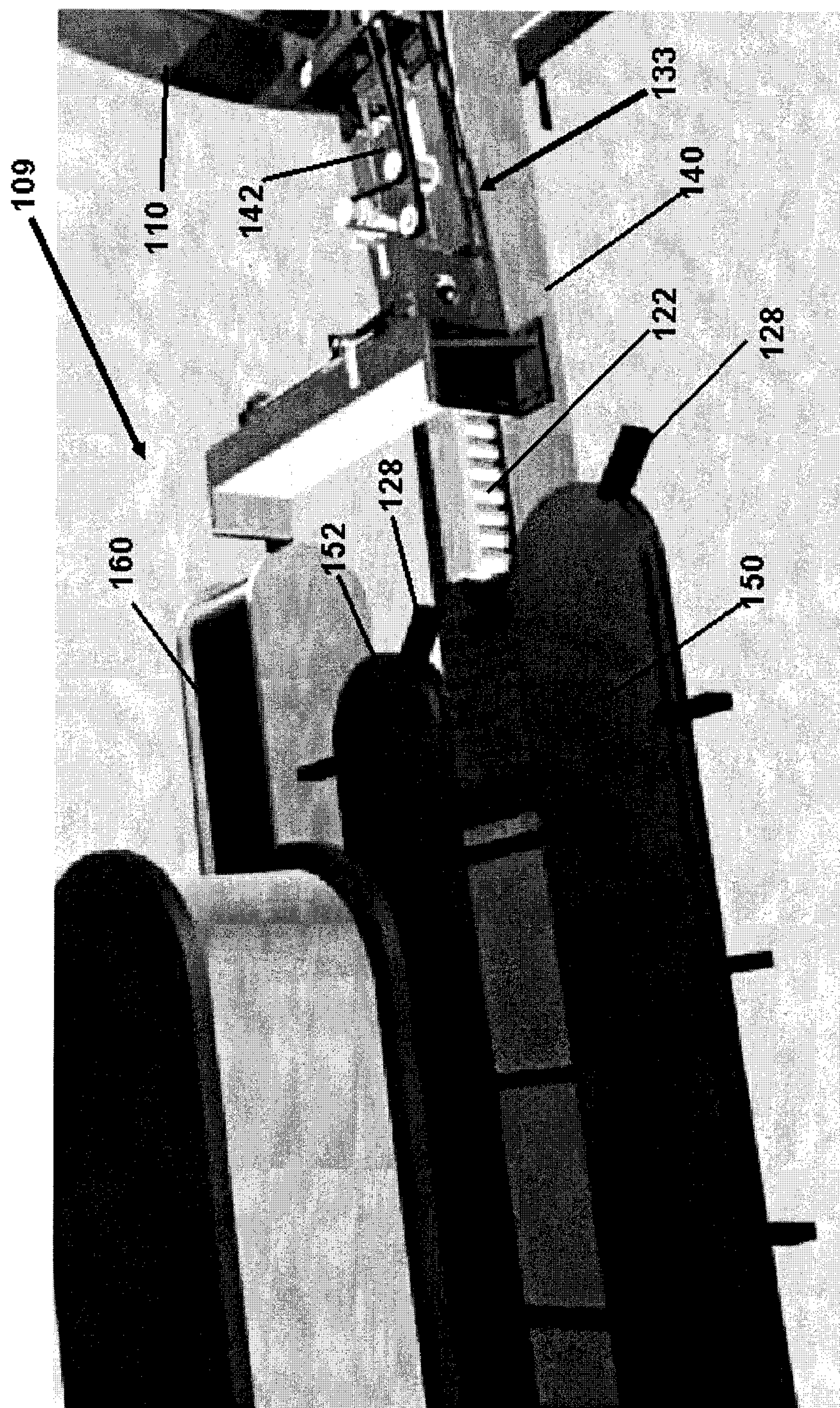


Figure 2

- 3/12 -

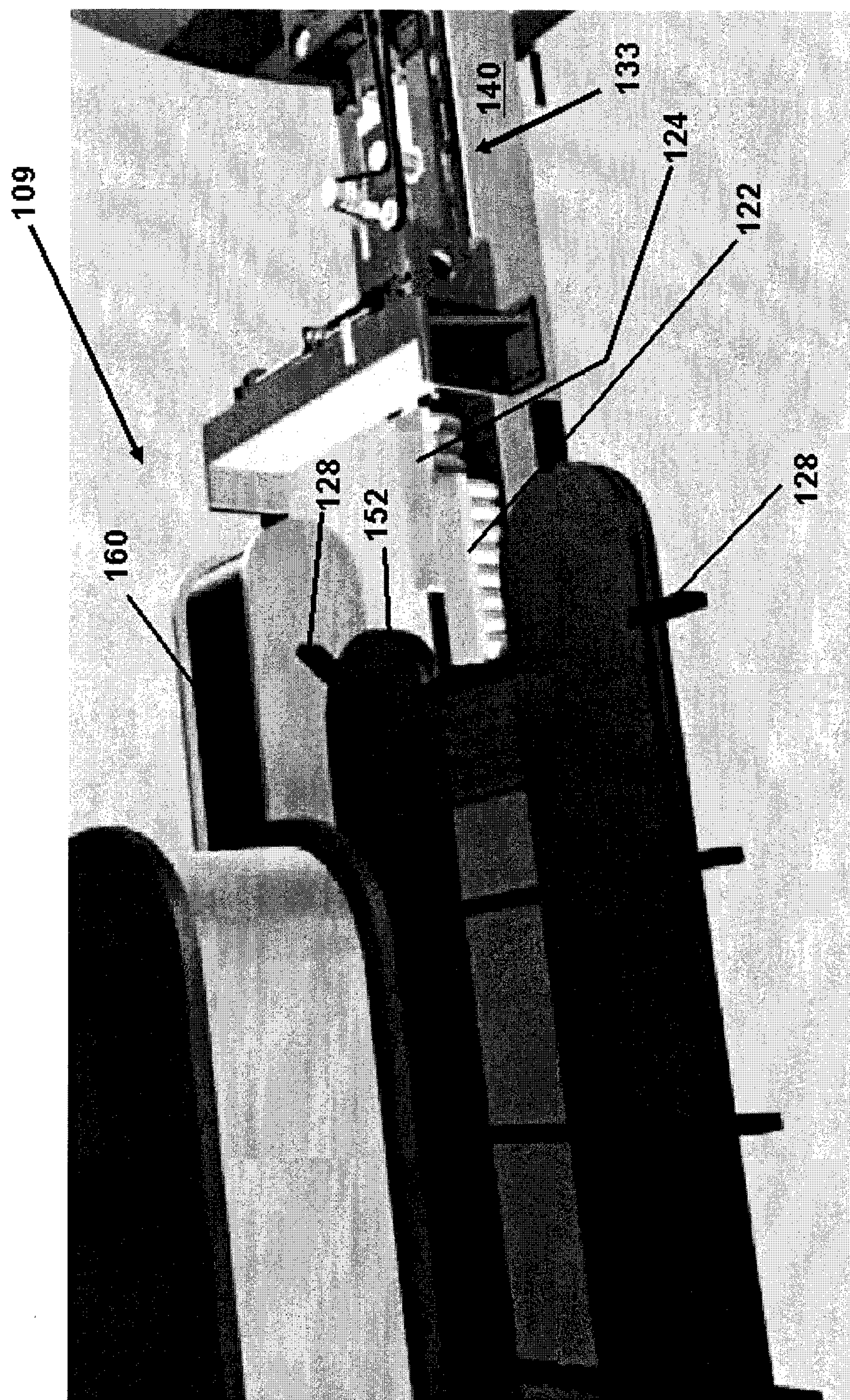


Figure 3

- 4/12 -

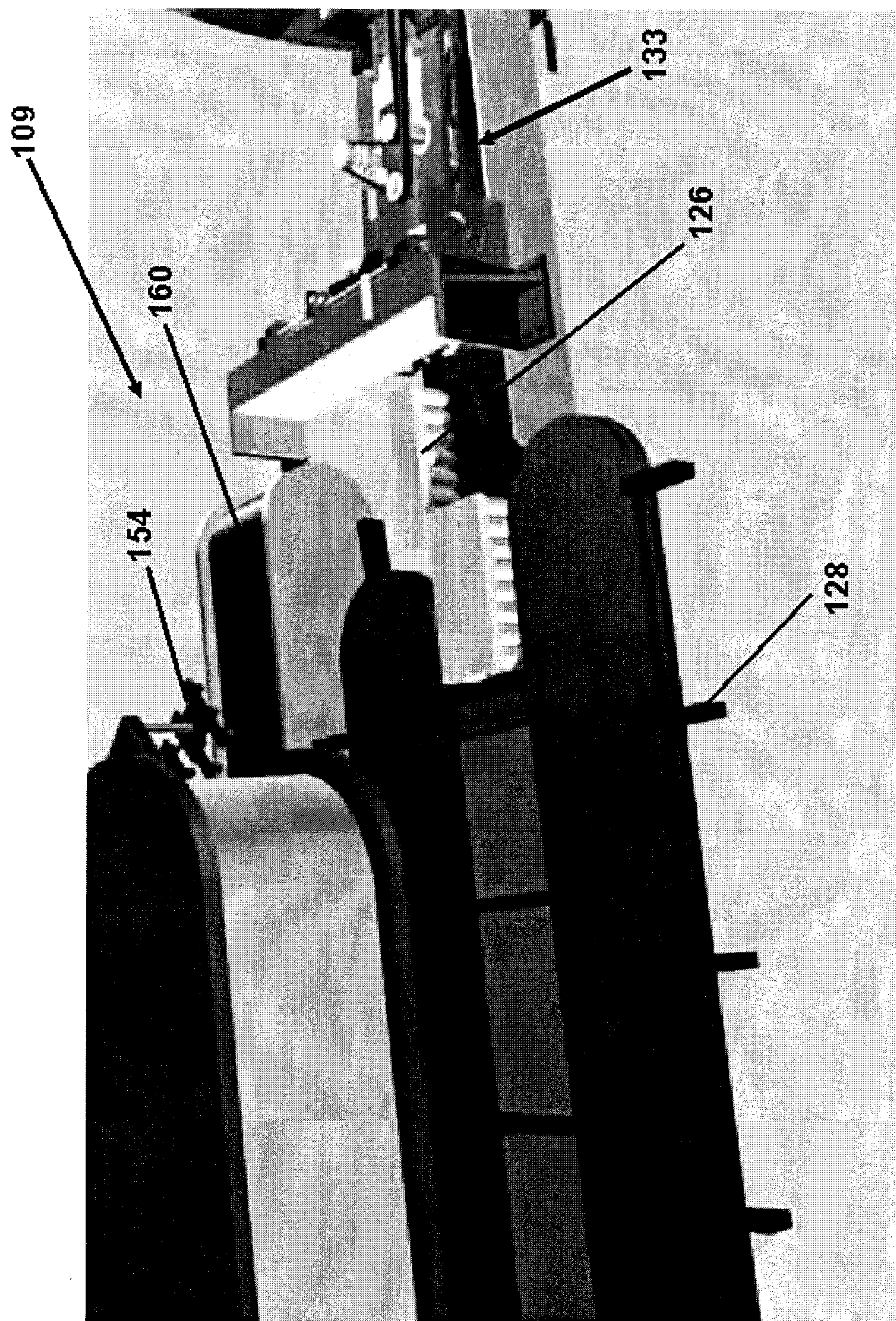


Figure 4

- 5/12 -

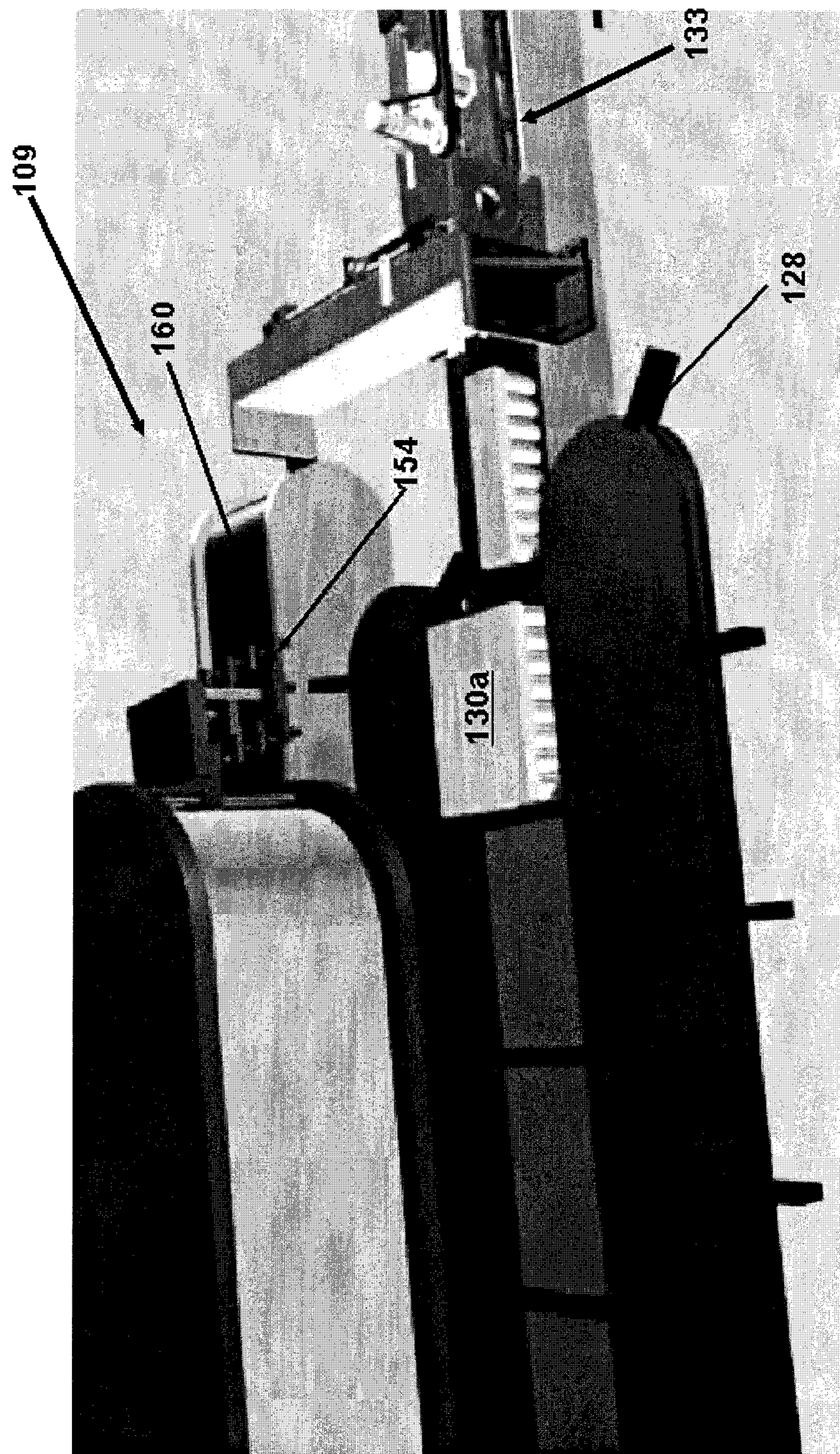


Figure 5

- 6/12 -

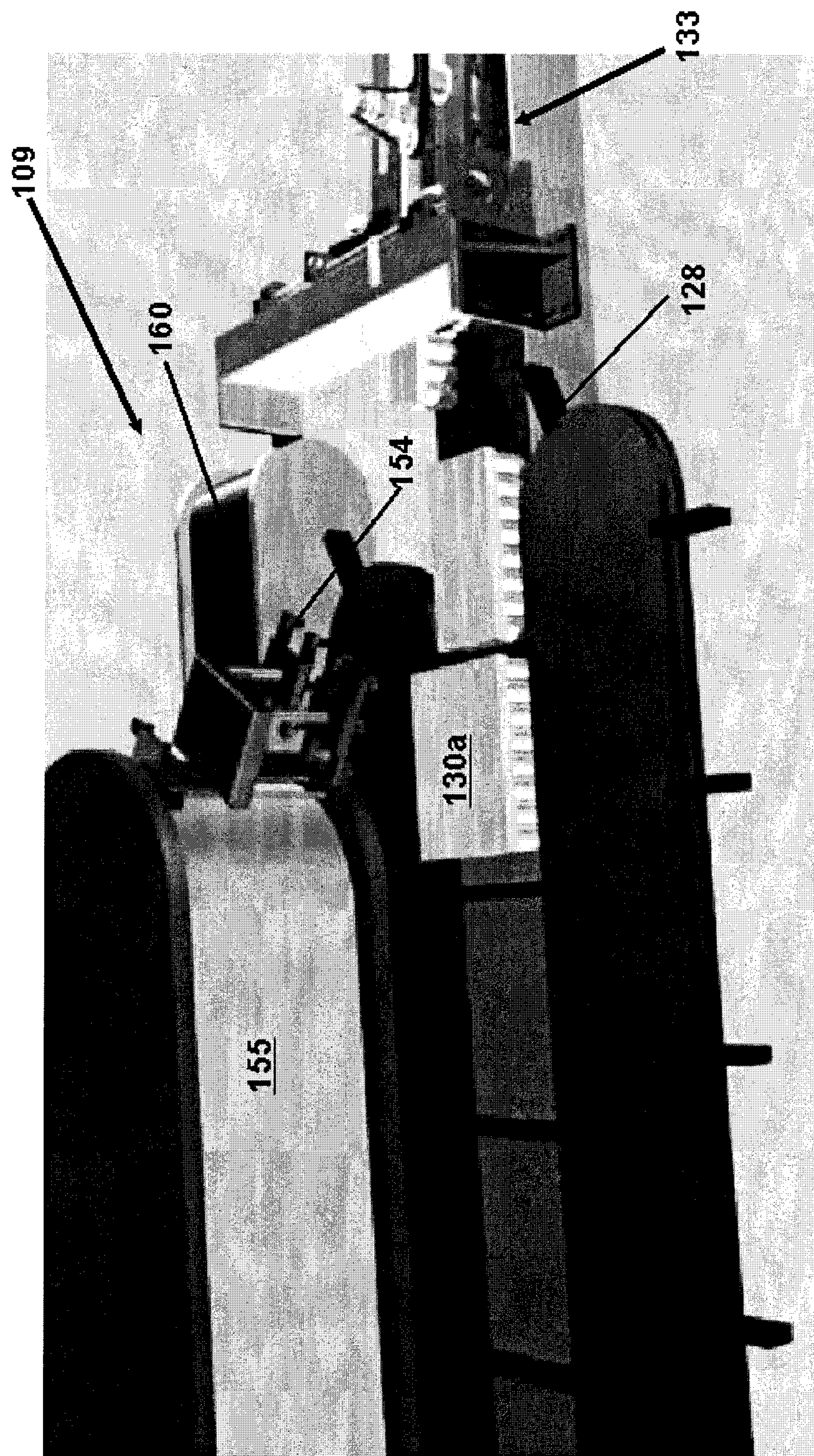


Figure 6

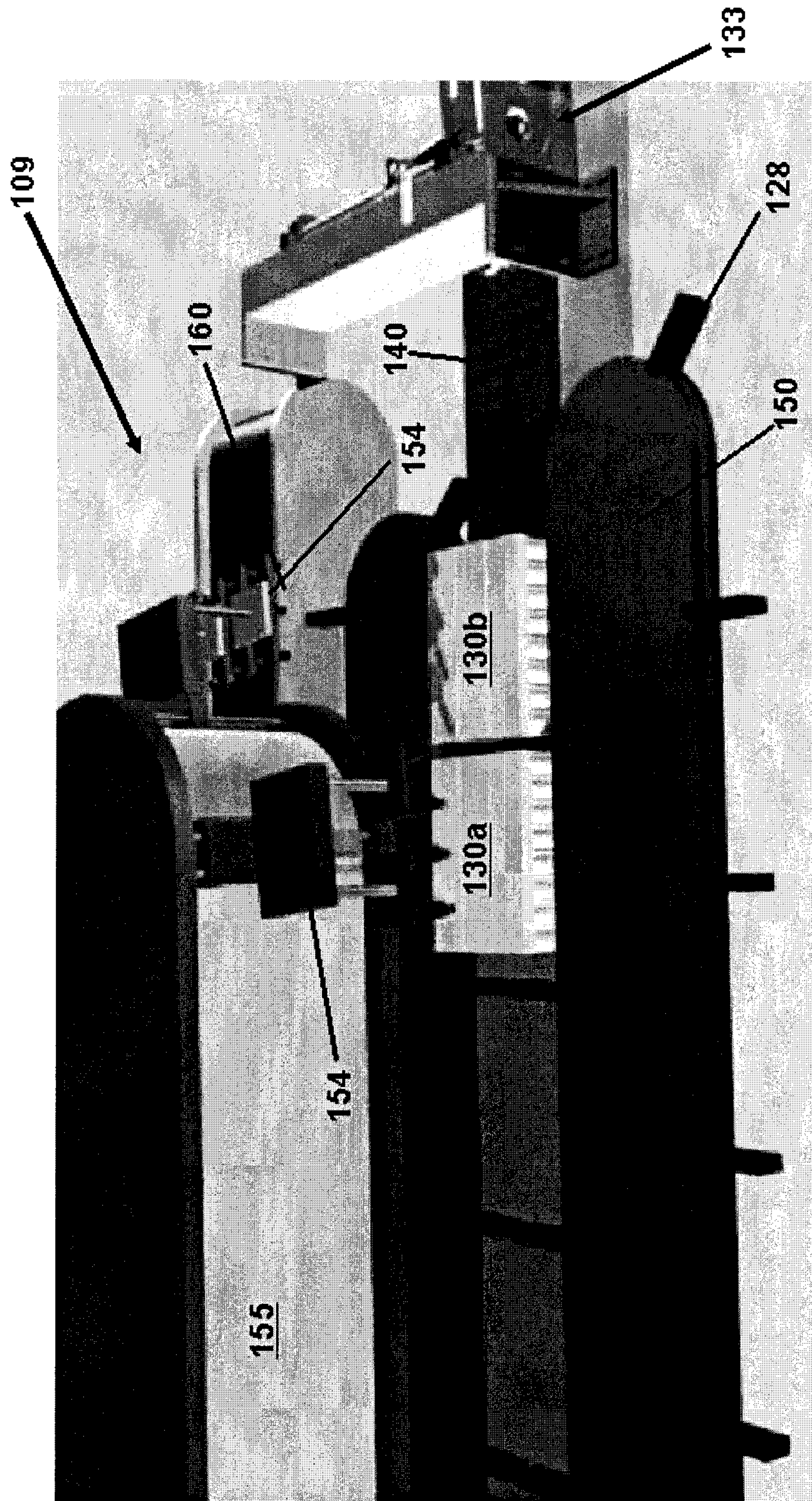


Figure 7

- 8/12 -

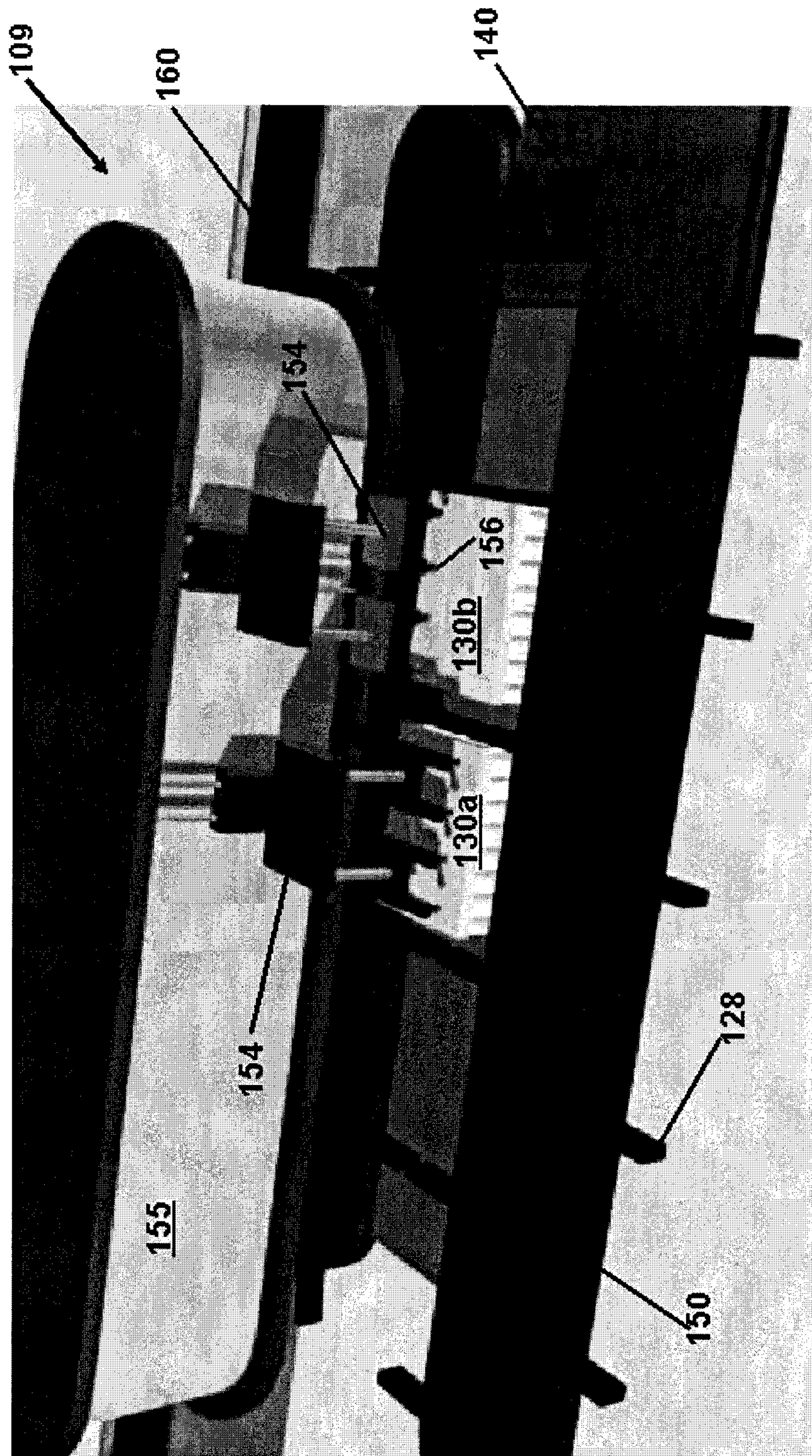


Figure 8

- 9/12 -

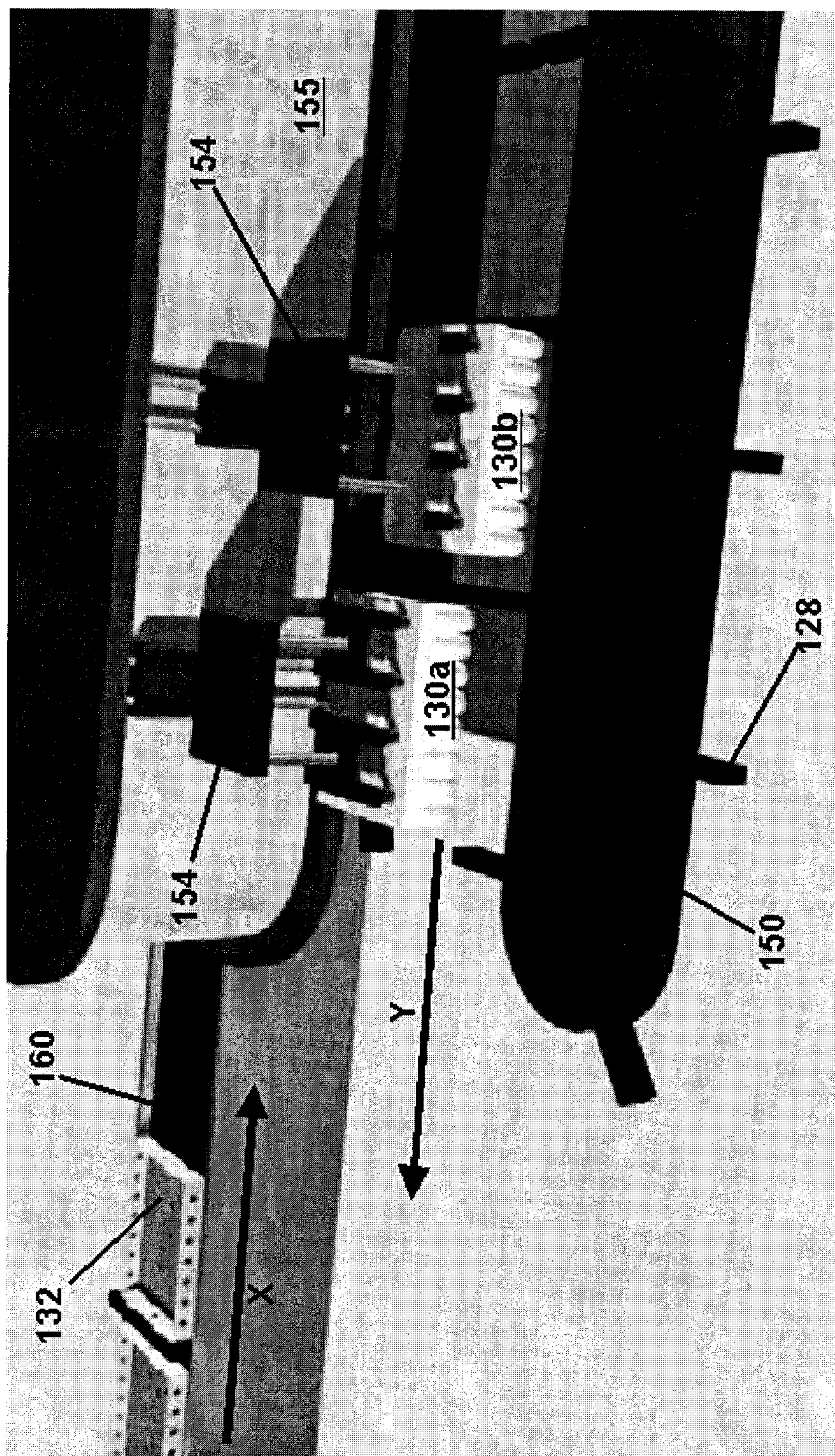


Figure 9

- 10/12 -

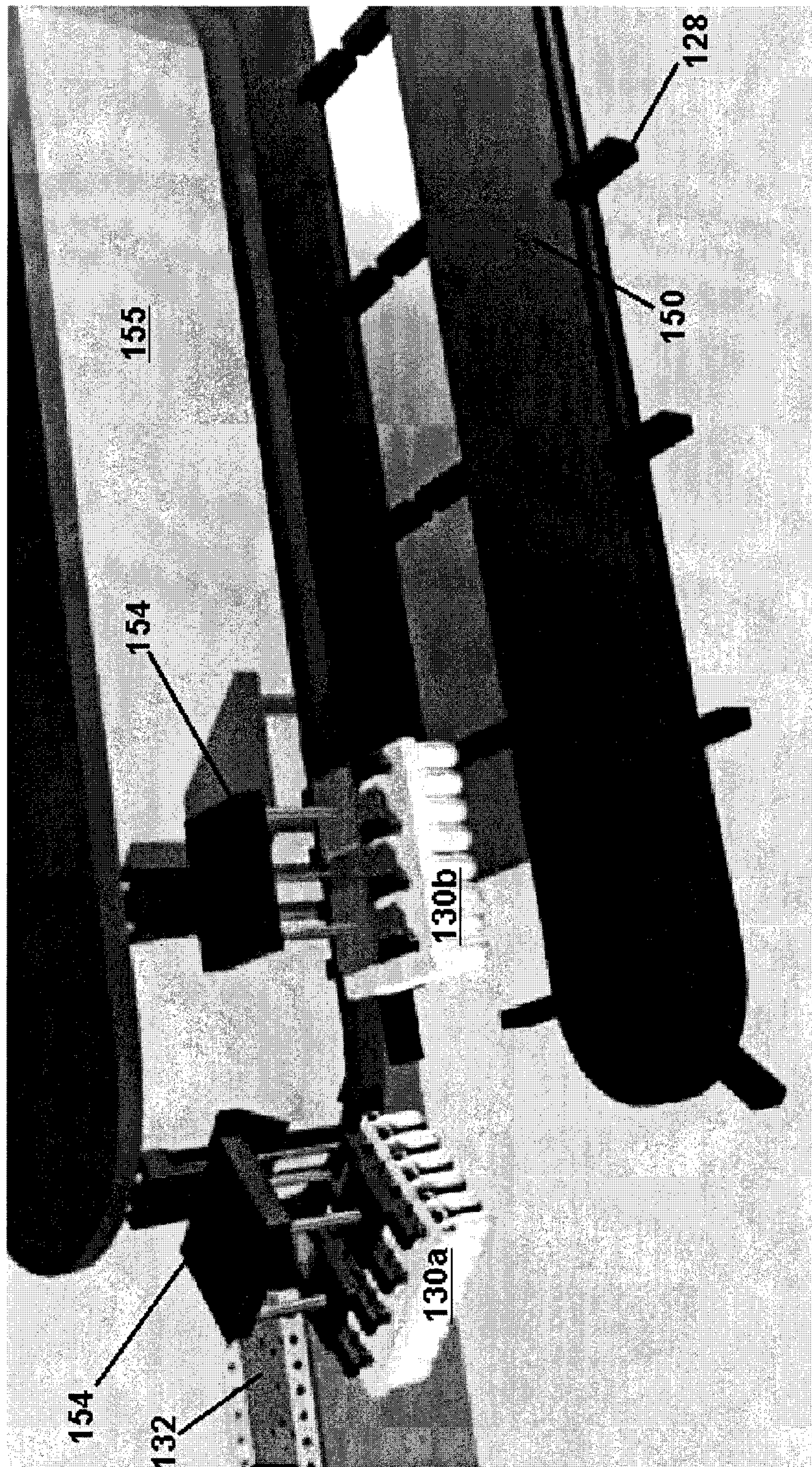


Figure 10

- 11/12 -

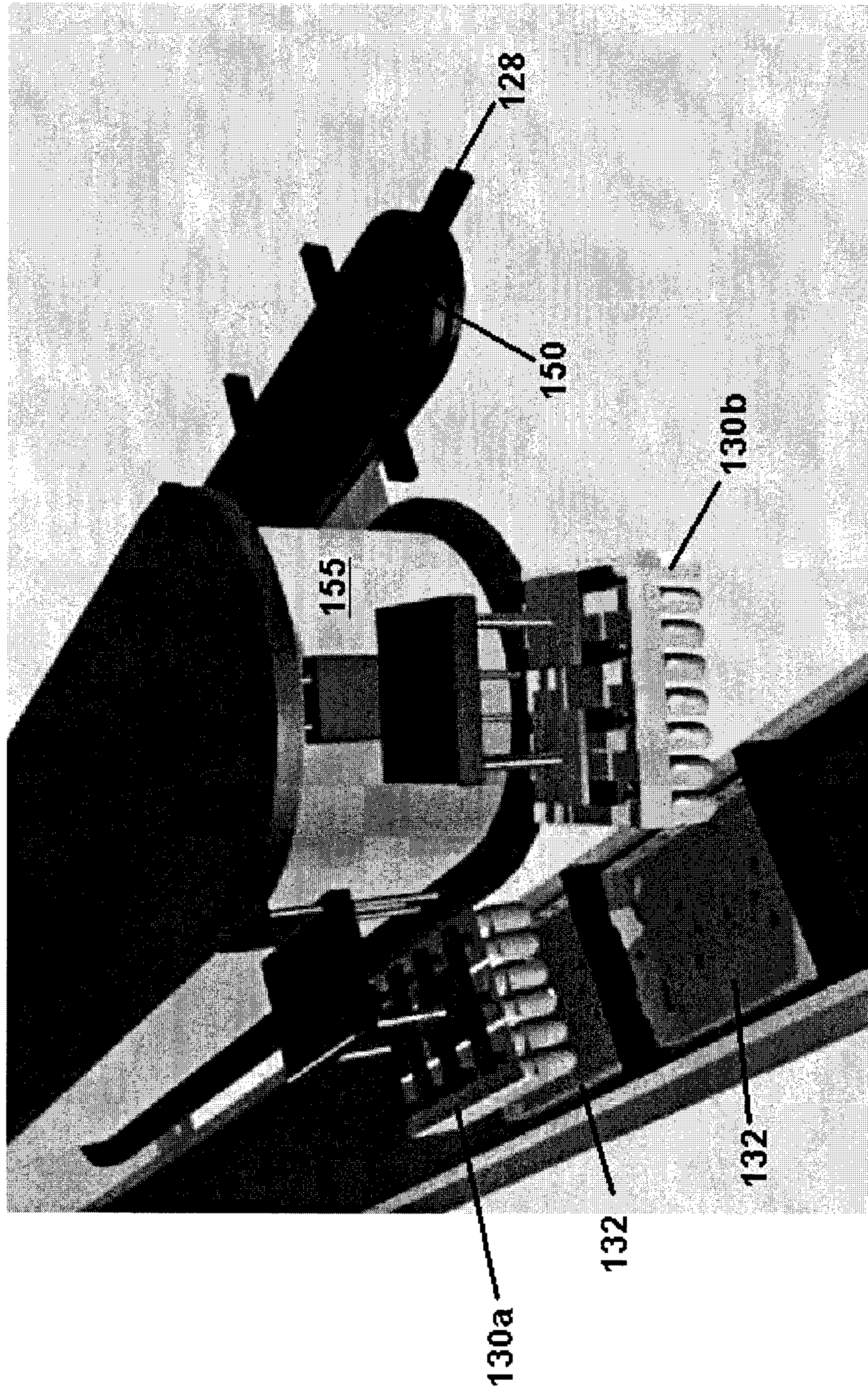


Figure 11

- 12/12 -

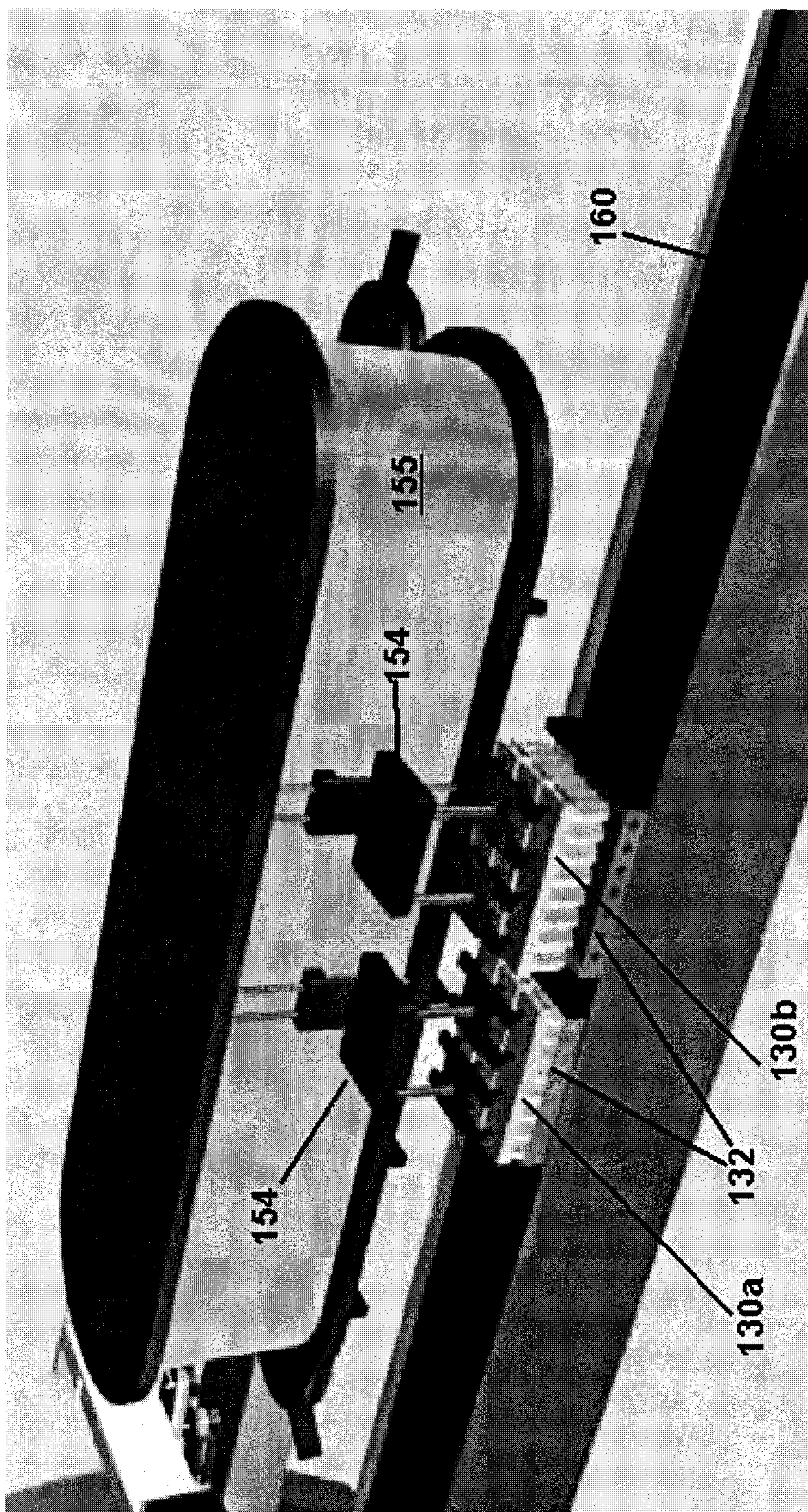


Figure 12

